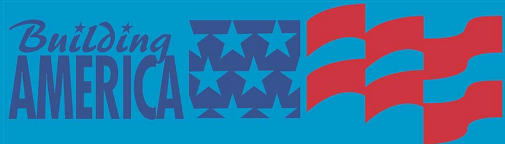
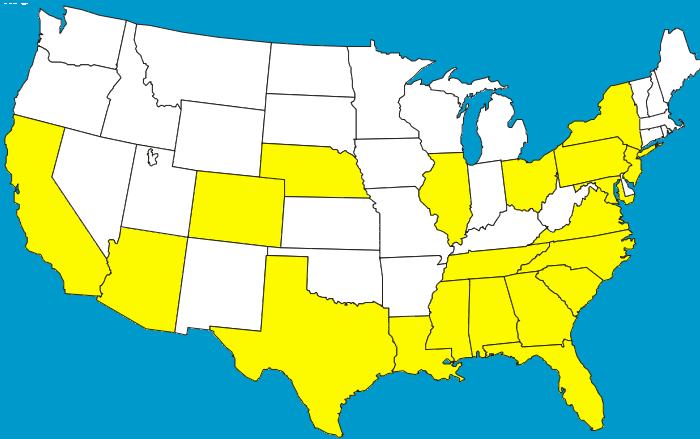


# Consortium for Advanced Residential Buildings (CARB)

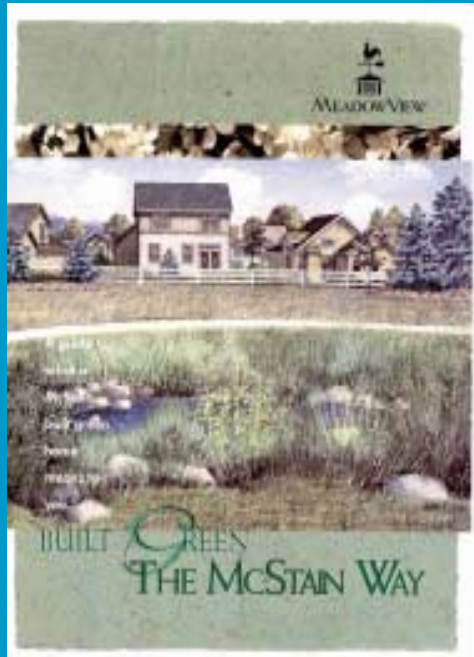


- ◆ **Located:** Norwalk, CT
- ◆ **Lead:** Steven Winter Associates, Inc.
- ◆ **Members:** 12 Builders  
24 Suppliers  
16 Supporting organizations

- ◆ **Mission:** To achieve significant and measurable improvements in housing and energy performance in large numbers of housing units.



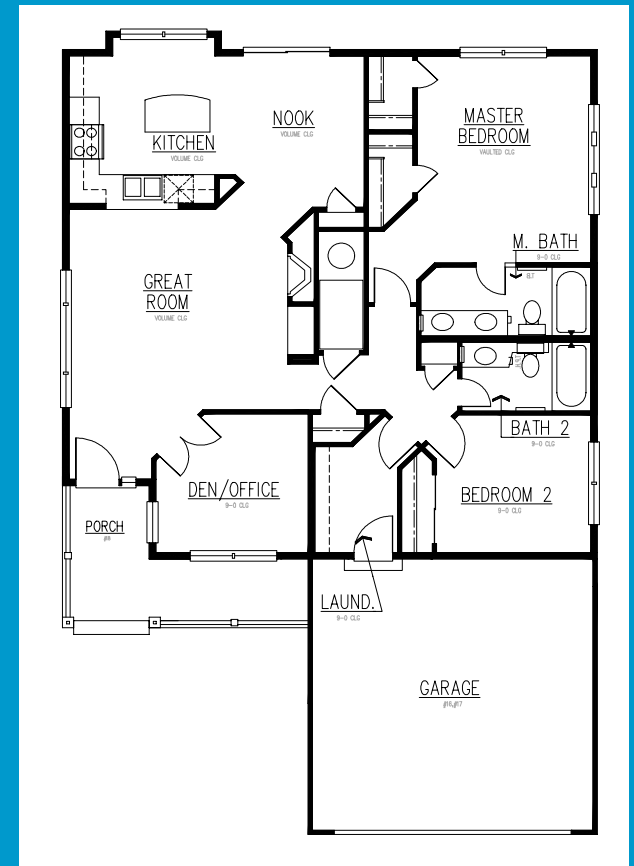
# McStain - Boulder, CO

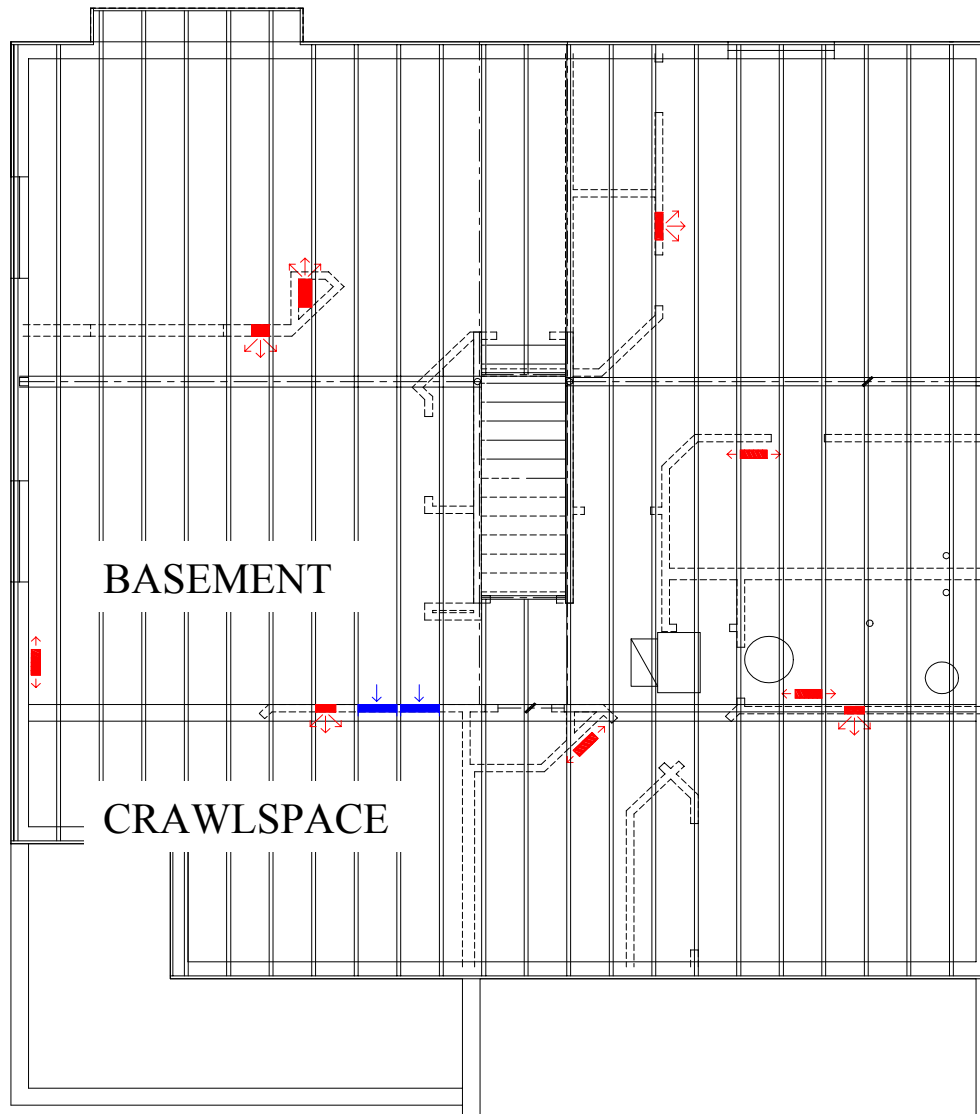


- HVAC System Sizing
- Value-engineered floor framing and duct layouts
- Ventilation System Specification
- In-field Testing by NREL

# McStain Cottage Series

## The Garden Cottage





## ➤ Consolidated Duct design

- primarily high interior wall supply
- central return
- coordinated with floor framing

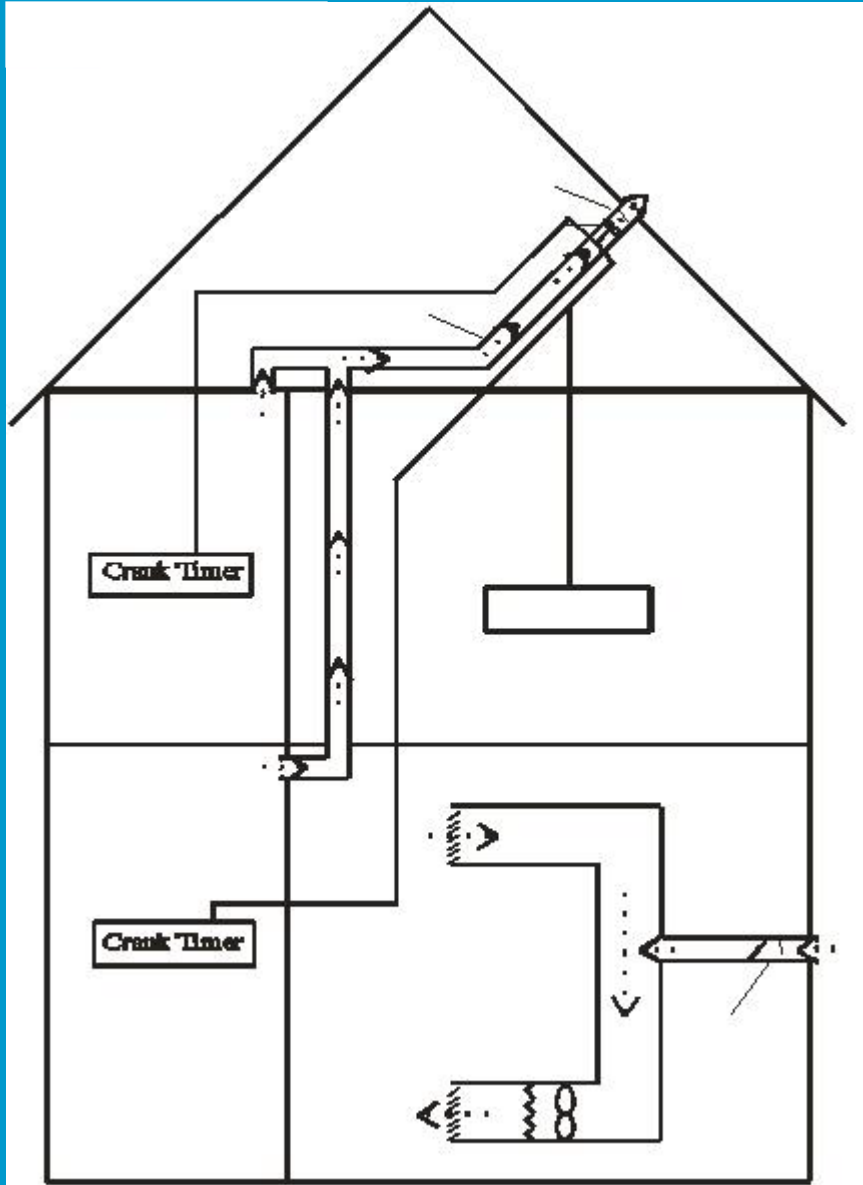
# McStain Enterprises, Inc.

## ➤ Characteristics

- High quality, tight construction
- Sealed combustion/direct vent furnaces, water heaters, and fireplaces
- Cold, dry climate

## ➤ Objective

- Develop a reliable mechanical ventilation system to address indoor air quality



## ➤ Ventilation

- central exhaust fan pulls from bathrooms
- control box programs duty cycle
- crank timer at each bath



# Implementation Status

- Initial system introduced in 42 Cottage Series homes in Meadowview
- Refined system to be standard equipment in all homes in Indian Peaks West development
  - 92 Cottage Series (1200 to 1800 sf)
  - 65 6400 Series Homes (2100 to 2600 sf)
- Builder Training
  - with Colorado Built Green

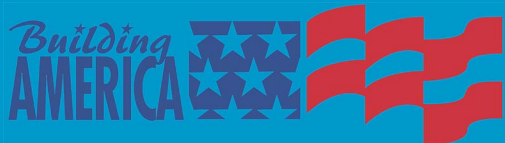
# Mitchell Homes - Pensacola FL

## ➤ Energy Star

- low e windows
- right sized HVAC
- reduced duct leakage

## ➤ Worked with EPA to develop builder specific BOP

(Builder Option  
Package)





# Mitchell Homes - Pensacola FL

- 125 homes in Pensacola
  - 525 to be completed in 2001 among Pensacola, Mobile, Orlando and Gulfport Biloxi



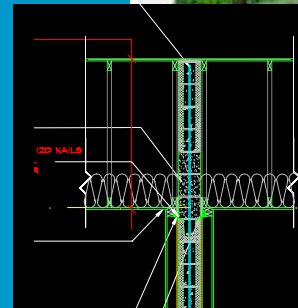
# Cambridge Homes - Libertyville, IL

- Forest Glen Townhomes
- Carillon Lakes Community
- The Glen TND



# Forest Glen Townhouses

- Design of 3 unit types
  - Energy Star units
  - FHA compliant
  - Energy efficient detailing
- Innovative site plan
- 60 units at Forest Glen
  - additional sites in future



# Carillon Lakes Community



- Four, six - plexes, single family
  - Energy Star
    - low e windows
    - upgraded insulation
    - programmable t-stat
    - refined HVAC

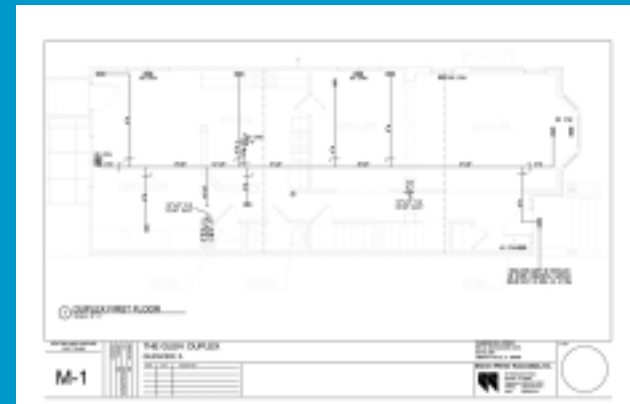


- 200 homes this year
  - Build out of 947 homes



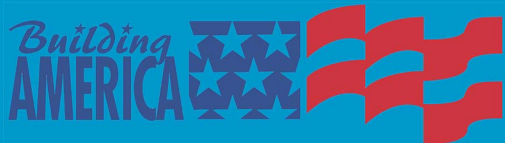
# The Glen

- Townhomes, duplexes, single family detached
  - Energy Star
    - Low-e windows
    - upgraded insulation
    - programmable t-stat
  - HVAC design
  - 244 homes

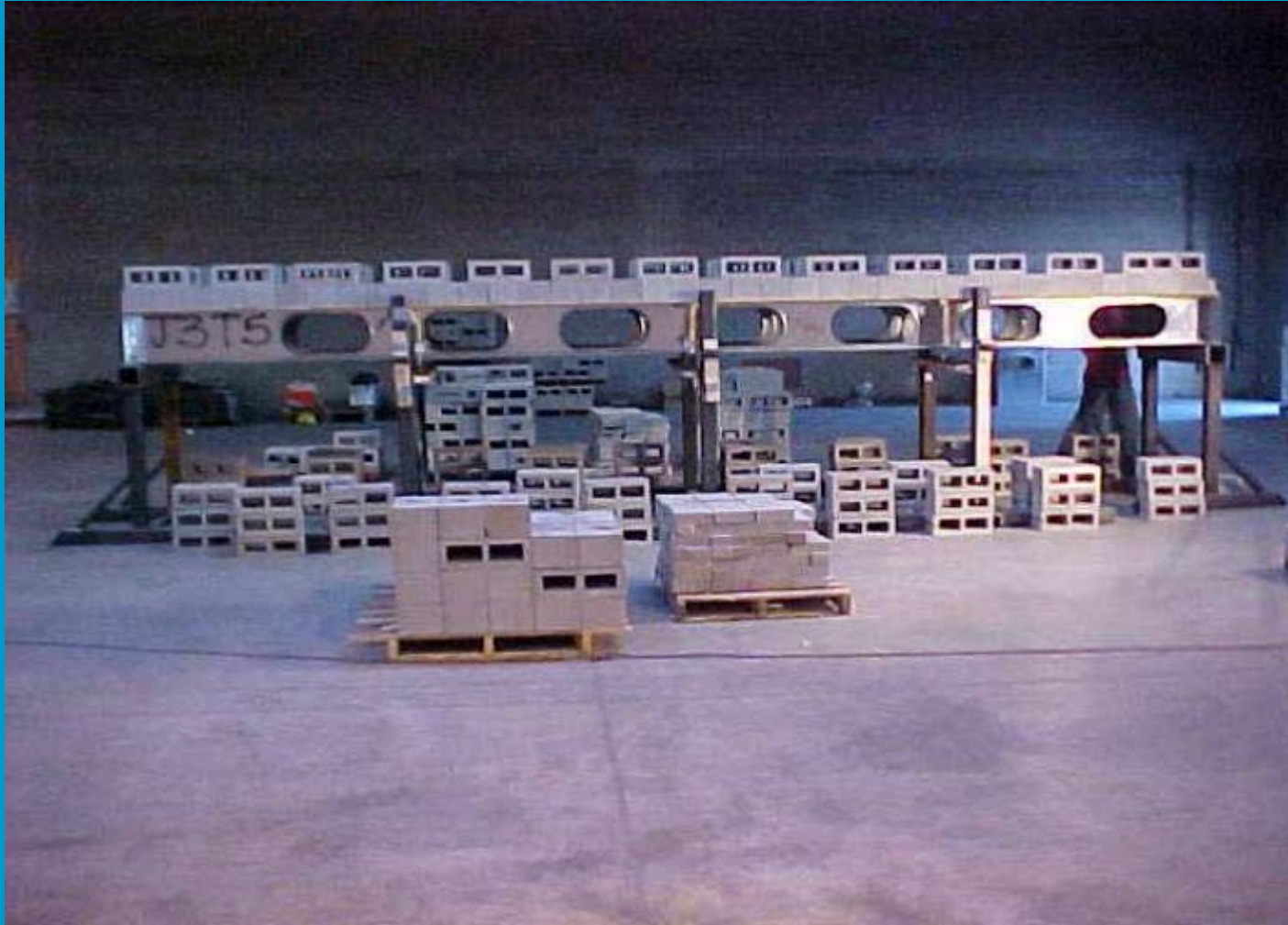


# CARB Builder Members

CARB Member	Completed/Under Construction	Planned 2001
Ryan Homes	3	
Del Webb	3	
Cambridge Homes	40	464
Crosswinds	2	
Mercedes Homes	8	175
Beazer Homes	1	50
Wonderland Builders	1	
Mitchell Homes	125	525
McStain Enterprises	48	157
Samson Homes	1	
Palm Harbor Homes		1
<b>Total</b>	<b>232</b>	<b>1372</b>



# Steel Floor Framing System



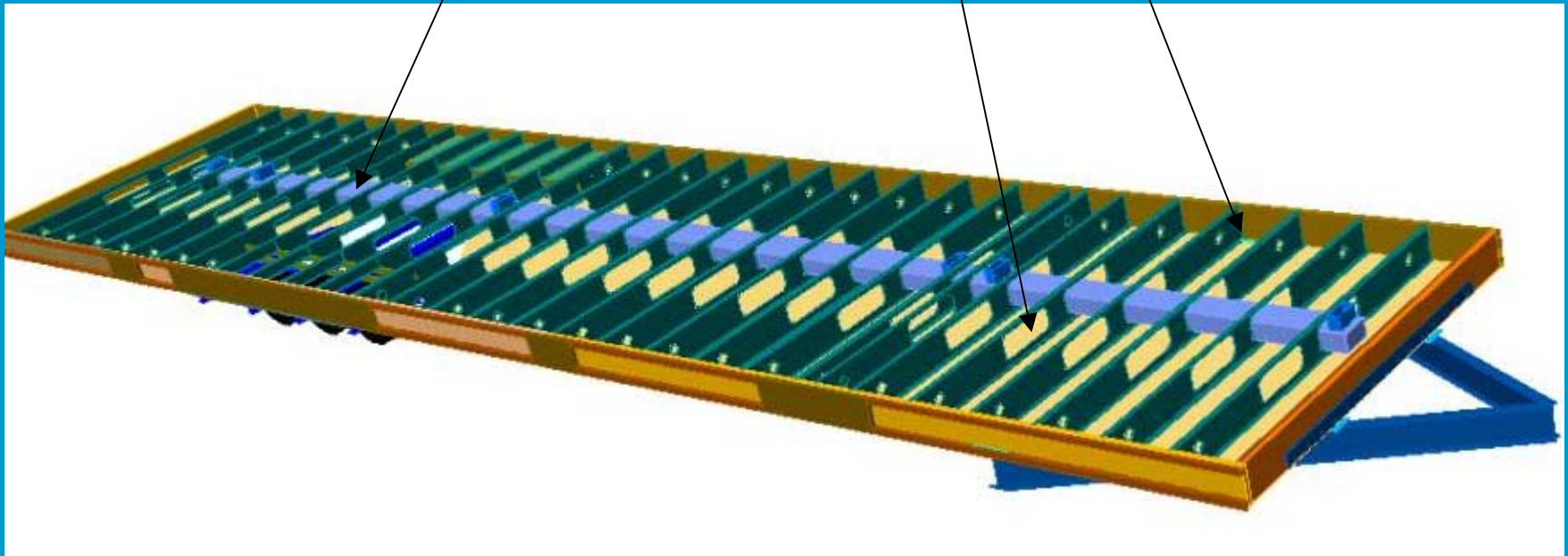


# Steel Floor in a Manufactured Home

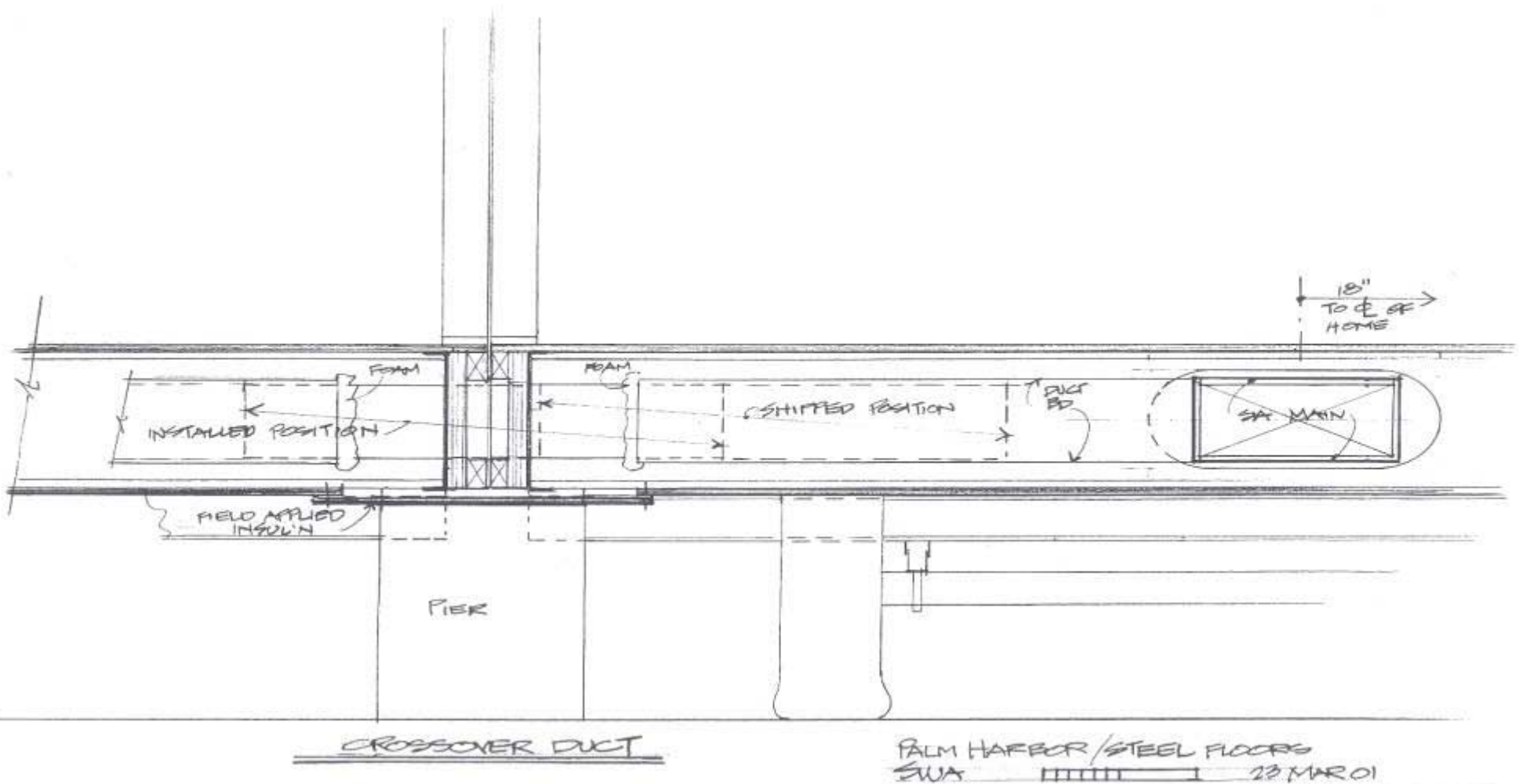
Typical trunk line location

Clear spans steel joists

10" x 23" holes

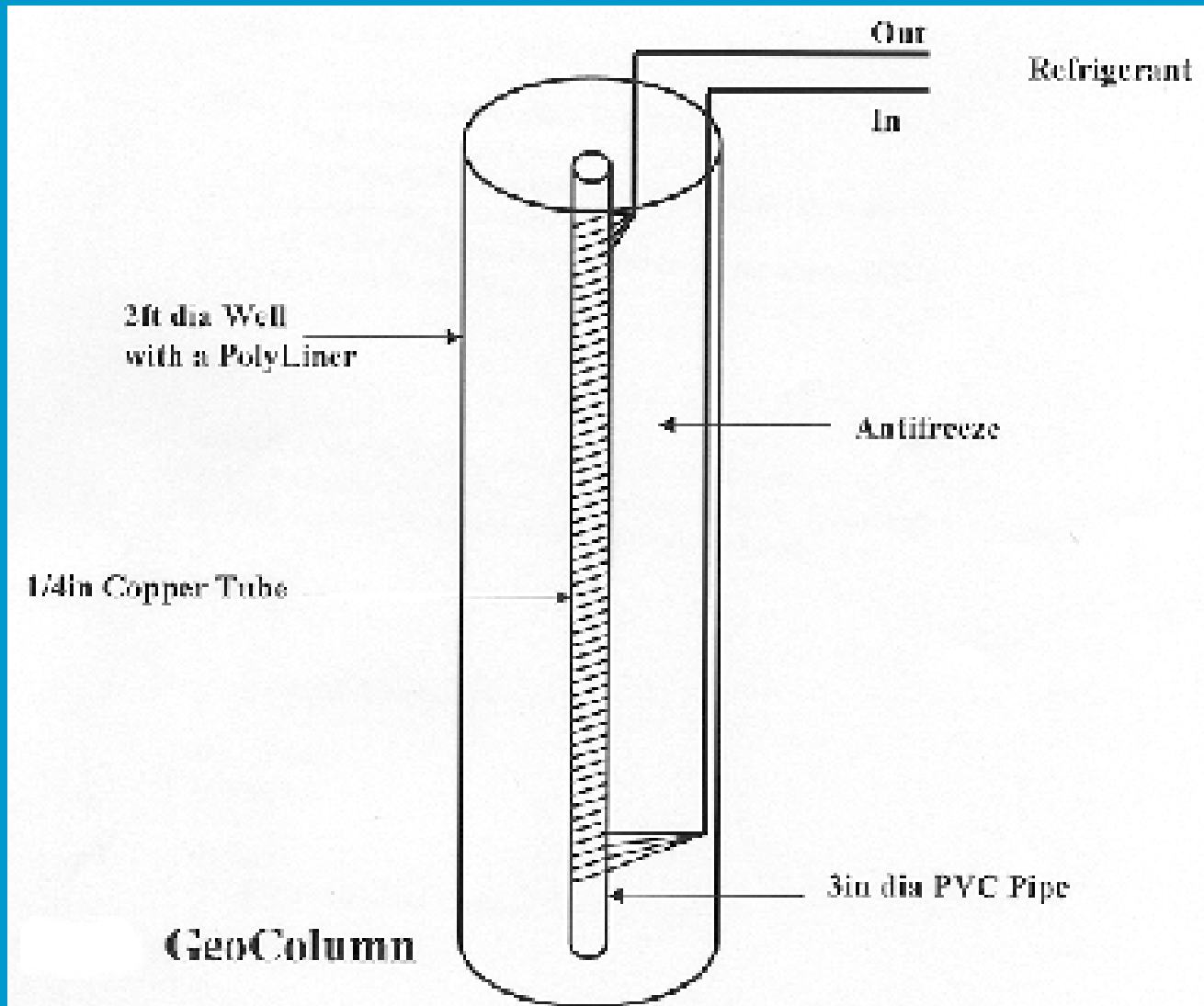


# Marriage Wall/Cross-Over Duct Detail



# GeoColumn Geothermal Heat Pump

- DX Technology
- Wells are drilled using standard utility augers
- Two GeoColumns 20' deep x 2' Dia. provides 1 ton capacity



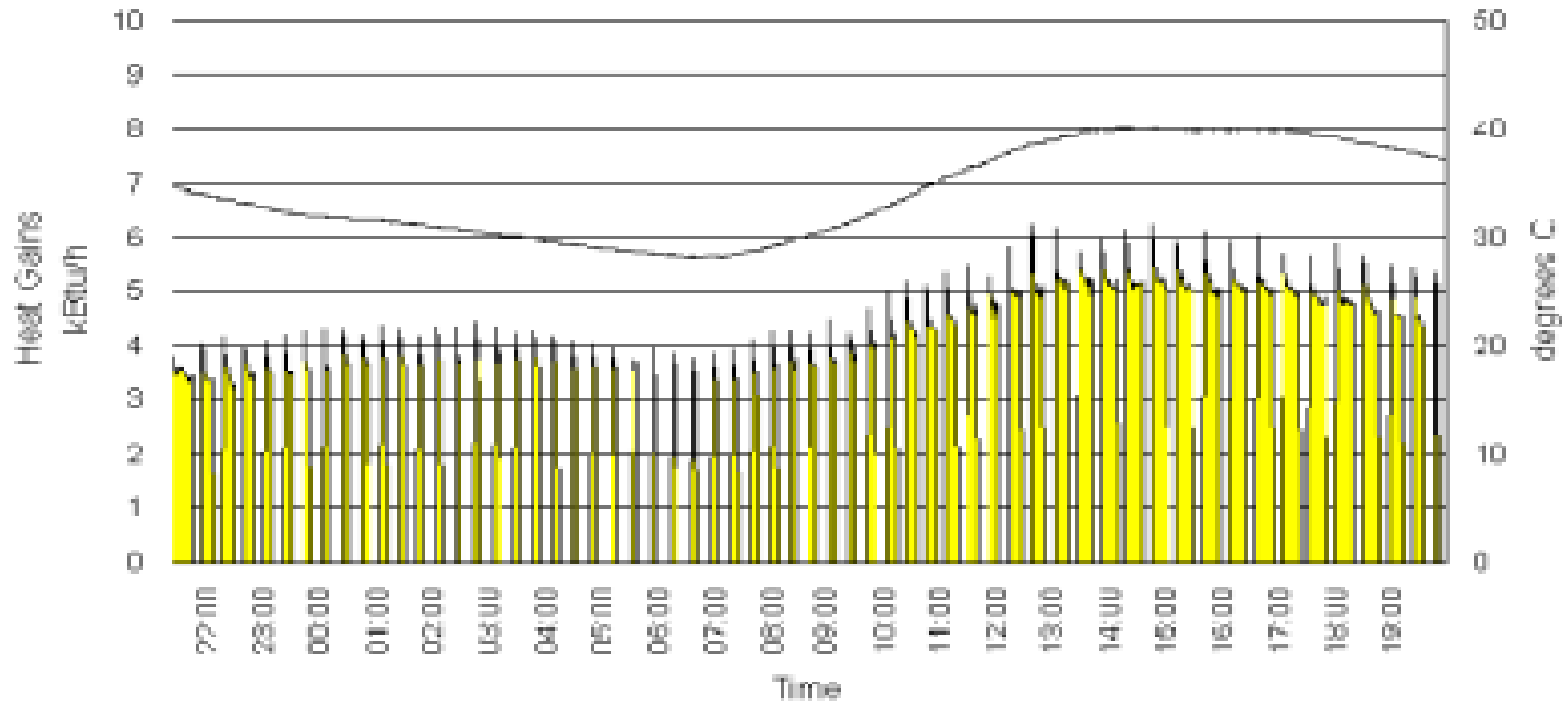
# Typical Builder Practice: Ducts in the Attic



# Duct Conduction Heat Gain

Control House 1

Duct Conduction Heat Gains and Attic Temperature

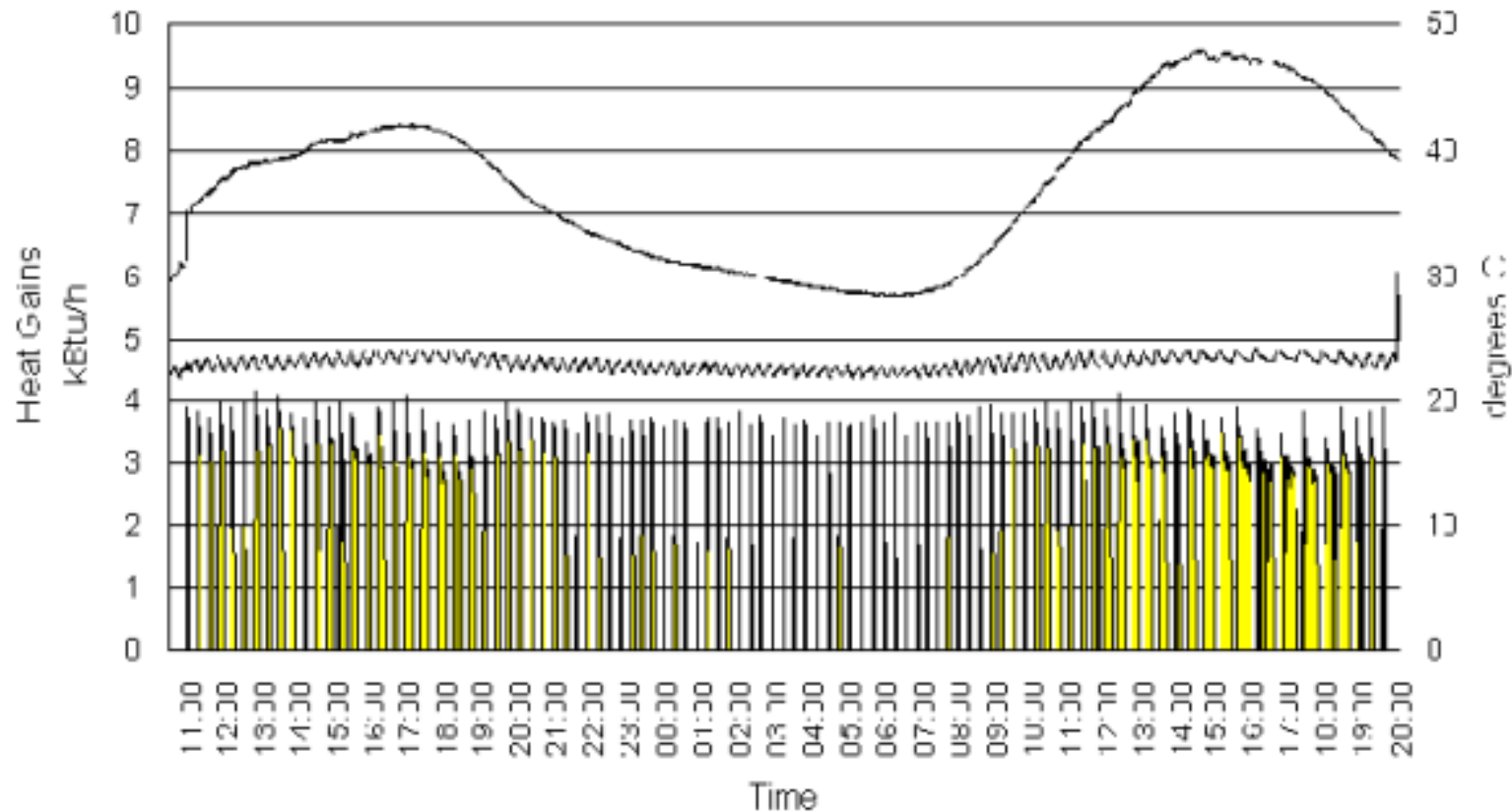




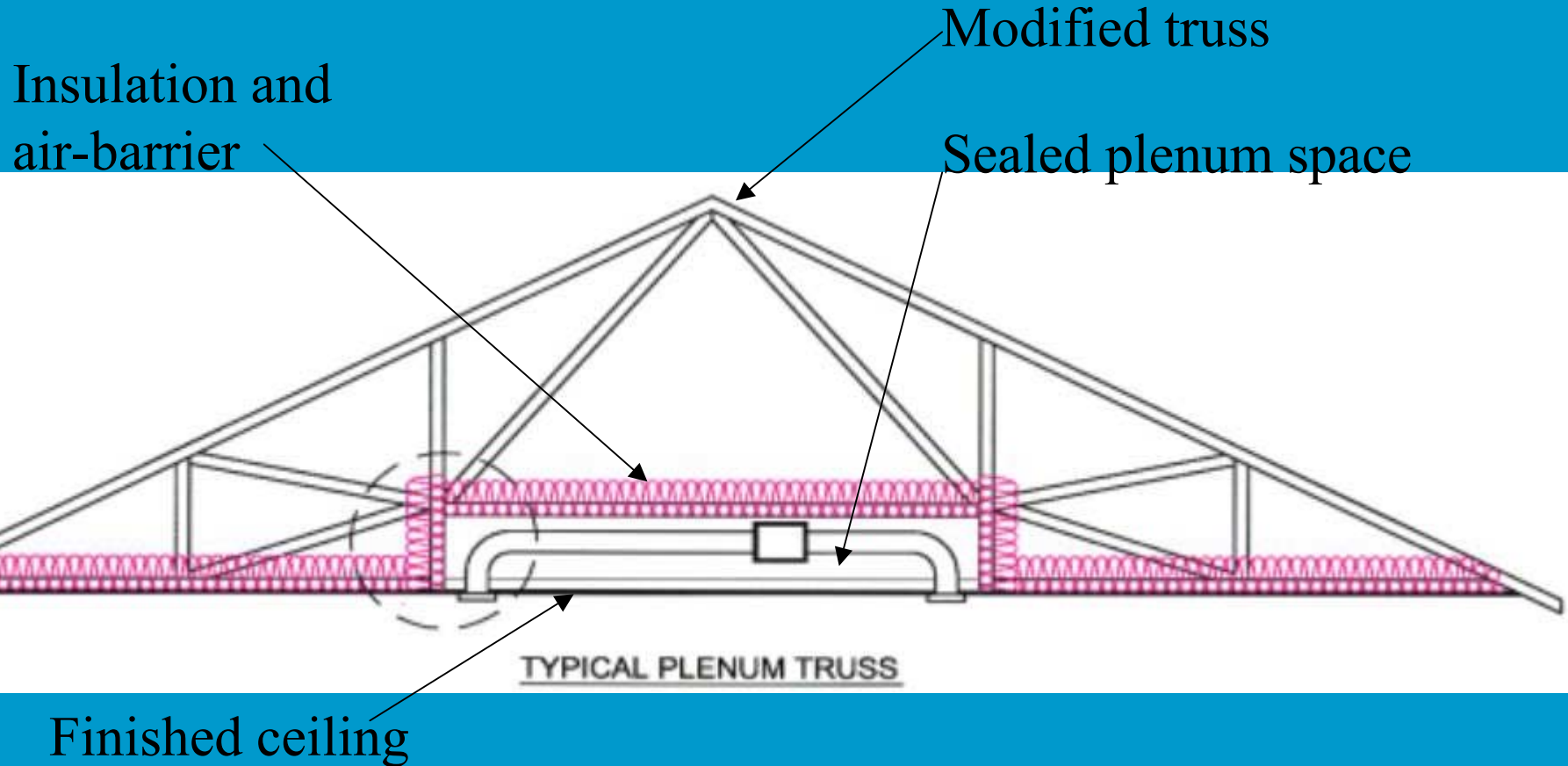
# Thermally Protected Ducts

Prototype House

Duct Conduction Heat Gains, Attic and Thermostat Temperatures

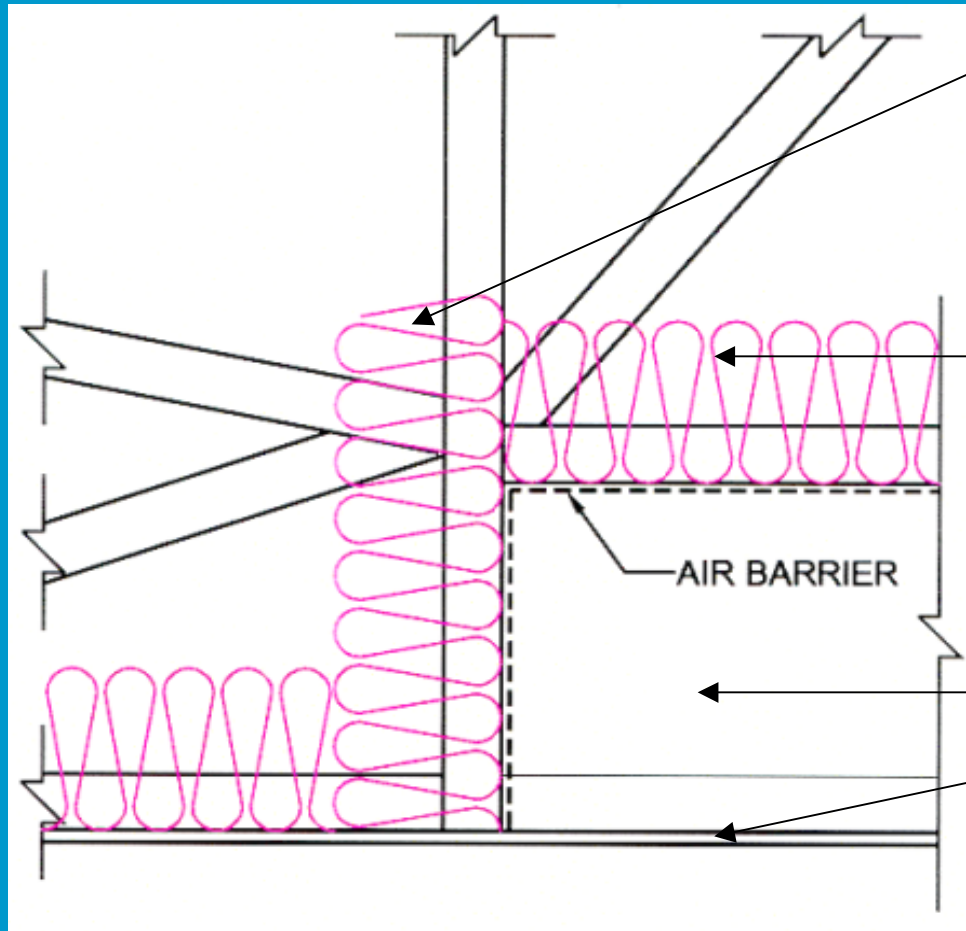


# Mercedes Homes Plenum Truss





# Plenum Truss Detail



Friction-fit fiberglass batt

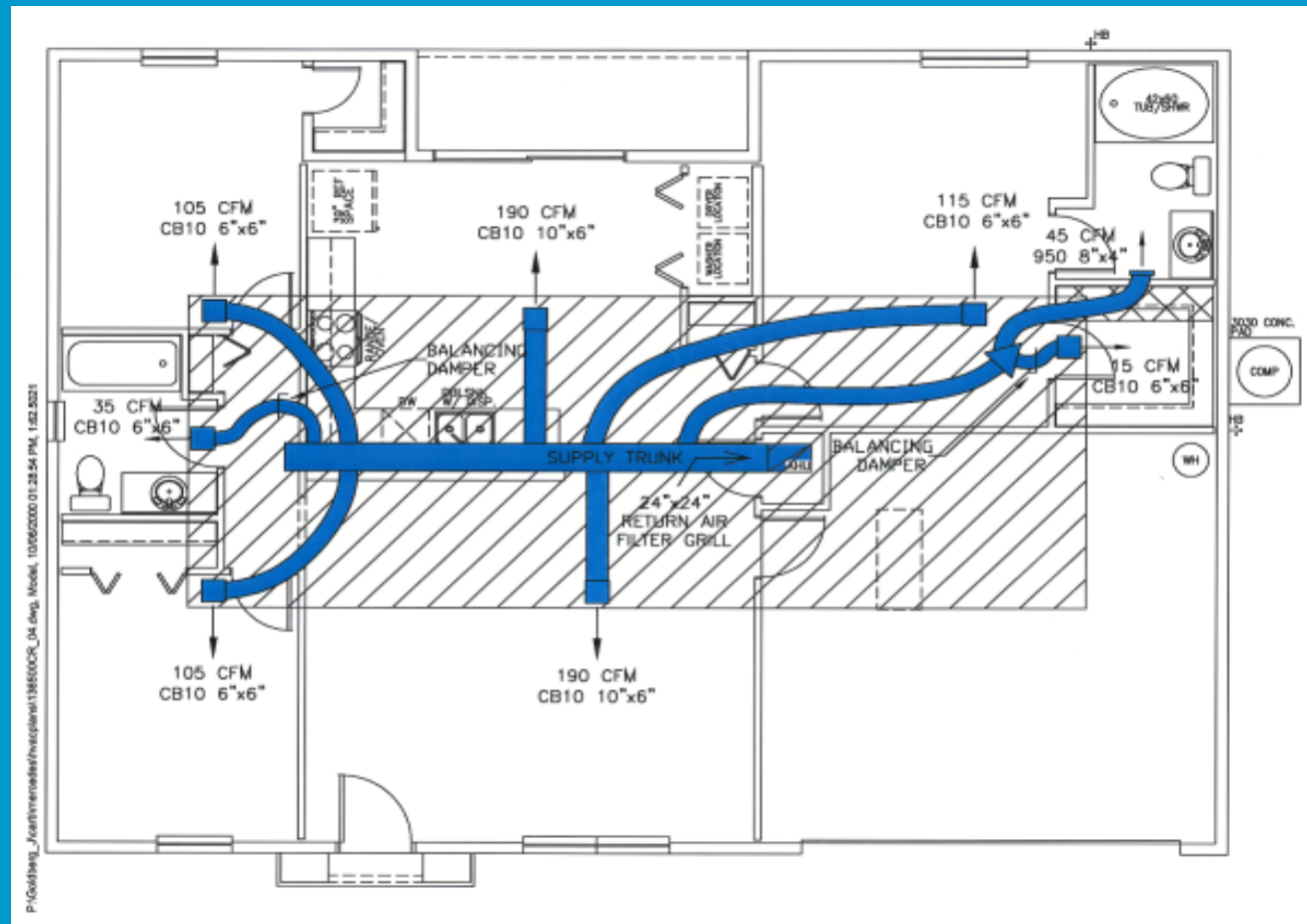
Loose-fill fiberglass insulation

AIR BARRIER

Duct space

Gypsum board ceiling

# Duct Layout and Plan Integration



# Installed Modified Trusses

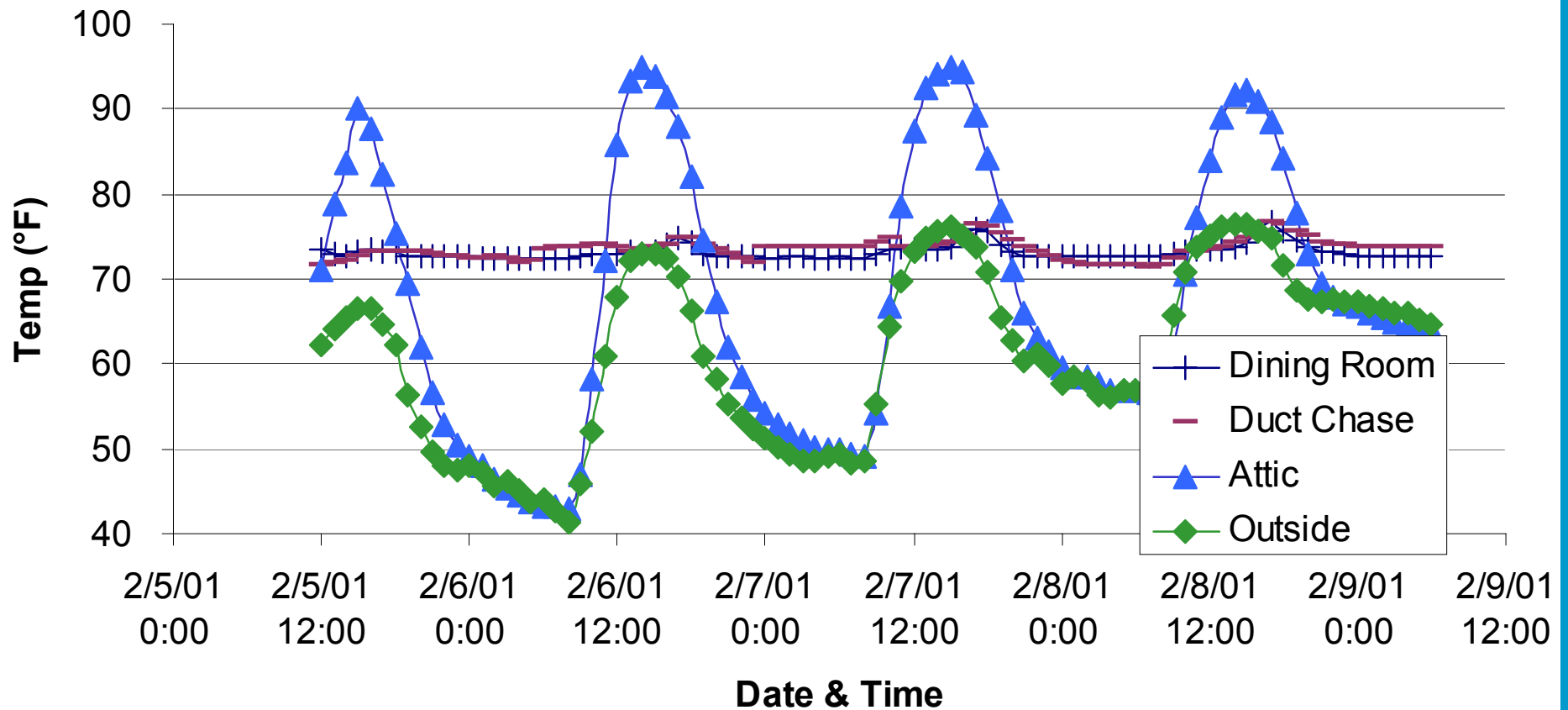




# Ducts Installed in Plenum Area

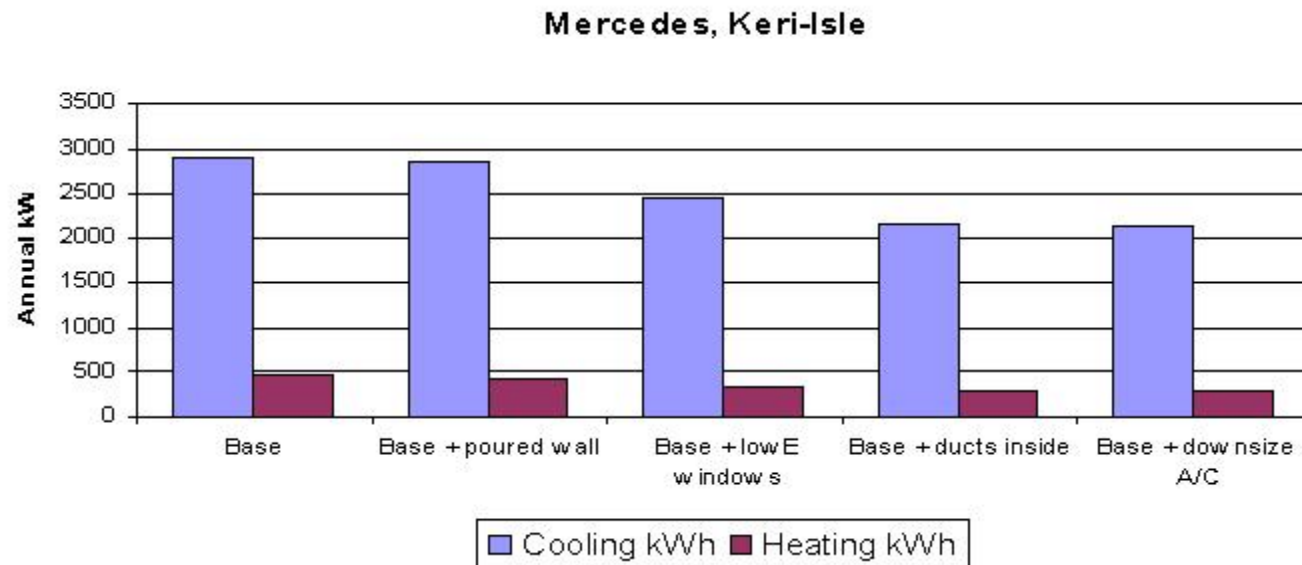
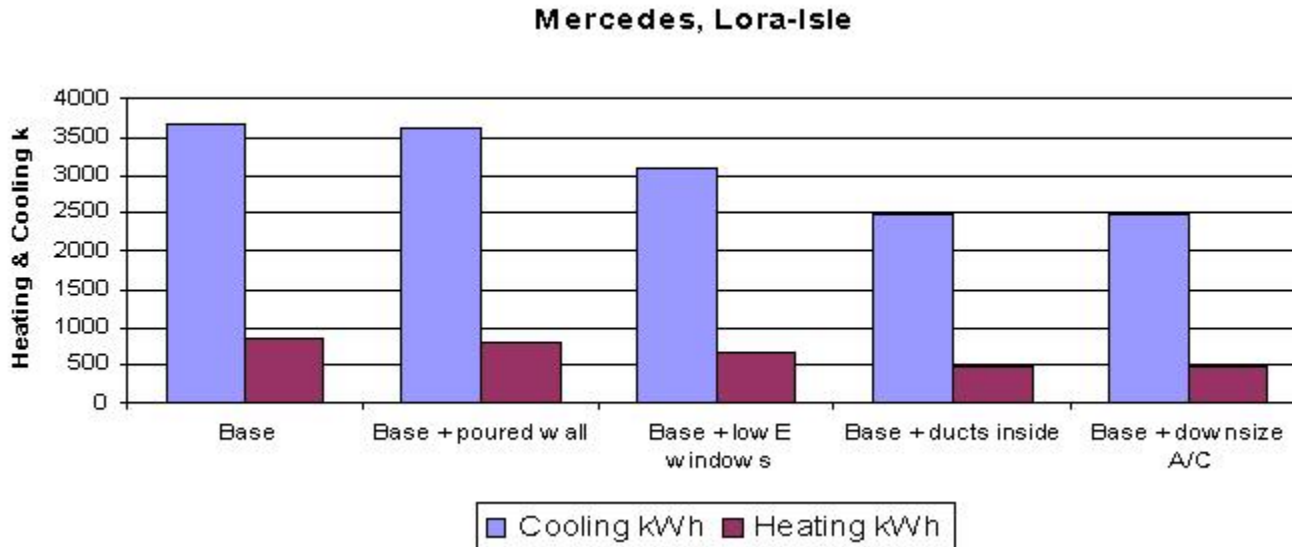


# Plenum Space Thermal Testing



## NREL DOE 2 Results:

35% reduction in  
heating & cooling



28% reduction in  
heating & cooling

# Continued Research & Implementation

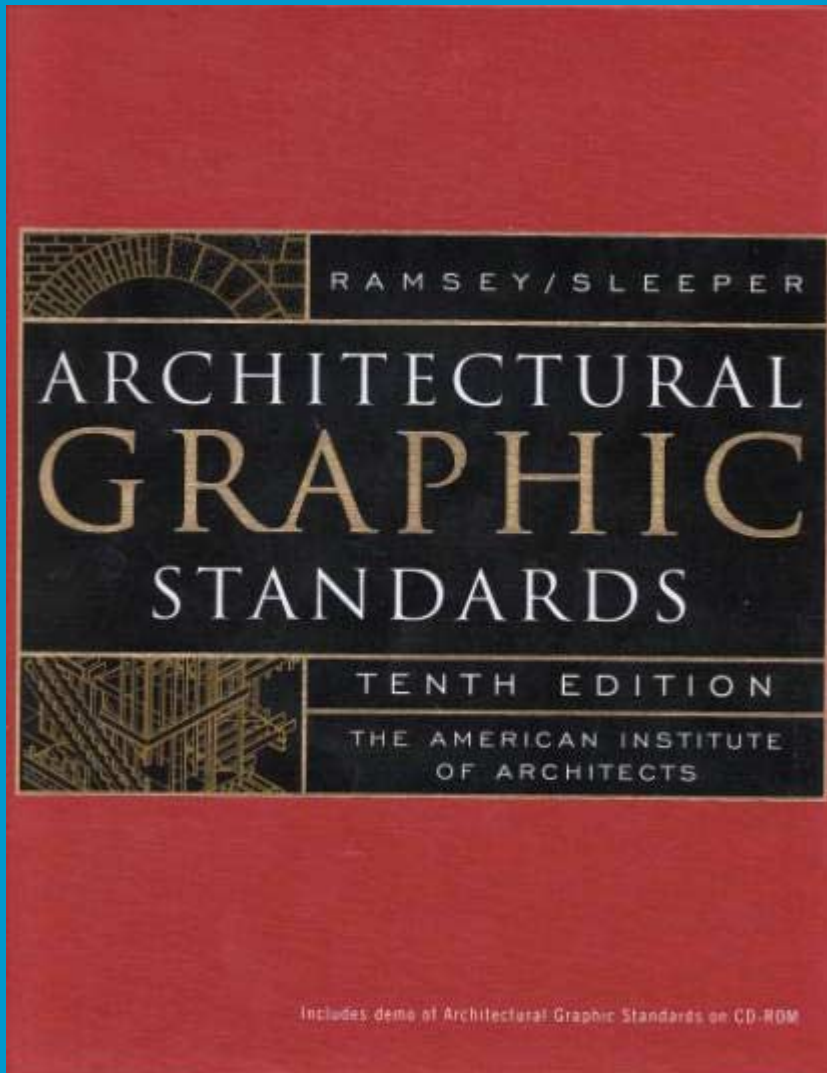


- R & D continues w/ Mercedes on the modified truss and plenum
- 175 of the EnergyStar qualified houses are planned in 2001



# Building America Outreach and Training

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Following lessons learned through Building America, CARB will be editing and expanding the first exclusively residential version of *Architectural Graphic Standards*.

New sections including systems engineering and whole-house design will be added.

